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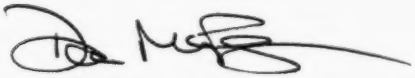
Directive 062

April 29, 2008

Coalbed Methane Control Well Requirements and Related Matters

The Energy Resources Conservation Board (ERCB)/Board) has approved this directive on April 25, 2008.



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1 Introduction

This directive brings together requirements and information on the coalbed methane (CBM) control well process previously found in various Energy Resources Conservation Board (ERCB) publications and on the ERCB Web site. In addition, it clarifies matters relating to deferral of or exception to control well requirements. The directive also includes requirements and issues specific to the control well process, but does not provide details on general data collection and submission requirements that are applicable to all CBM wells (e.g., geophysical logs, fluid analyses, well completions) and must also be met for CBM control wells. The term "control well" is used to mean CBM control well in all instances.

A CBM control well is a well established for the purpose of collecting pressure, productivity, and gas content information to allow for an understanding of gas resources in coals.

Prior to the establishment of control wells, the base data requirements for CBM wells were the same as the base data requirements for conventional gas wells. Producing CBM wells were required to have initial segregated pressure and deliverability data for each coal pool producing from the well. Standard fluid analyses data and annual pressure surveys also were required for each CBM pool.

In 2004, a control well program began evolving through applications for approval to commingle CBM and conventional gas in the wellbore. The ERCB recognized the need to broaden the scope of the control well program to bring all CBM development under the same testing requirements. As a result, the CBM control well requirements were established in the *Oil and Gas Conservation Regulations* (*OGCR*) issued October 31, 2006, and further clarified in the December 15, 2006, revision to *Directive 040: Pressure and Deliverability Testing Oil and Gas Wells*. All CBM developments in Alberta must follow these requirements to establish and test CBM control wells.

2 Requirements for the Designation of Control Wells

Section 7.025(1) of the *OGCR* states that

> A licensee shall not produce gas from coal unless the Board has designated
>
> (a) a control well that is within 3 kilometres of the producing gas well, to measure pressure and production in each coal zone, and
>
> (b) a control well that is within 5 kilometres of the producing gas well, for desorption testing.

Coal is defined in Section 1.020(2) (3.1) of the *OGCR* as a

> lithostratigraphic unit having greater than or equal to 50 per cent organic matter by weight and being thicker than 0.30 metres.

3 Minimum Testing Requirements for Control Wells

Pressure and flow testing requirements for CBM control wells are set out in Section 11.145(1), (4), and (6) of the *OGCR* and *Directive 040*.

Desorption testing requirements for CBM control wells are set out in Section 11.145(2), (3), (5), and (7) of the *OGCR*.

The above requirements are summarized in Table 1 of this directive.

4 Establishing and Evaluating Control Wells

4.1 Initial Considerations

Control wells must be established prior to production commencing from coals. Production is considered to be any gas obtained from a well regardless of disposition, including flaring, sales, lease fuel, or disposal. Both CBM desorption and pressure and flow control wells must be in place for any and all CBM developments, even if the CBM development is small in size (i.e., 1 to 3 wells). Control well obligations continue for the life of the CBM development that the control well supports.

If a desorption control well and a pressure and flow control well for each CBM zone to be developed does not exist within the prescribed radiuses, a licensee must establish the required control well(s) prior to commencing production in any well with completions in a coal, whether the production is from a single coal zone or from multiple coal and/or non-coal zones. All coal zones being developed must be validated in control wells within the prescribed radiuses. If existing control wells do not contain all of the coal zones planned for development in a new CBM well, additional control wells will be necessary to provide the required information for the coal zones that are not validated in the existing control wells.

In determining whether a control well is required, you should check the ERCB lists of designated control wells (available on the ERCB Web site www.ercb.ca under Industry Zone : Rules, Regulations, Requirements : Control Well Requirements) to determine if a control well already exists that would cover the coal zone(s) to be produced or if new a control well must be established.

Note that some desorption control wells are listed prior to the completion of desorption testing. Should such wells subsequently not pass validation upon review of the completed test report, their validation may be revoked and the well removed from the list of validated desorption control wells. Wells with preliminary validation (see Section 4.3) are identified in the control well lists available on the ERCB Web site. If you are still uncertain as to the status of a desorption control well, send a query to the ERCB Control Well Coordinator by e-mail to controlwells@ercb.ca.

CBM developers are encouraged to work together in selecting control wells in a CBM development area in order to make the control well designation process as effective and efficient as possible for all parties.

Table 1. Summary of minimum testing requirements for CBM control wells

Minimum requirement	Authorization	Timing of tests and submissions
Desorption control wells		
Desorption test (for each coal zone validated by the ERCB for the control well)	Section 11.145(2), (3), (5) and (7) of *OGCR*	• Full test report is to be submitted to ERCB within - 6 months following completion of the desorption analysis, or - 12 months following the designation of the control well, whichever occurs first. • Two paper copies and a CD ROM of the complete test report are to be submitted to the Section Leader, Coal and Unconventional Gas, Geology and Reserves, ERCB, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4. The report must include manometer readings, calculated gas content, all coal quality analyses, and scientific calibration of cuttings results to the core within the offsetting township. Both raw data and the analysis and evaluation of the data must be included in the paper copy of the report.
Pressure and flow control wells		
Initial pressure tests (segregated pressure for each coal zone validated by the ERCB for the control well)	Sections 11.145(1)(a), (4)(a), and (6) of *OGCR*; Section 7.1 of *Directive 040*	• Segregated tests are to be conducted and submitted to the ERCB electronically using the ERCB Well Test Capture system within 4 months of the ERCB validation of the control well. • The ERCB will also accept tests taken up to 12 months prior to the validation date of the control well as the initial test(s) for control well purposes.
Annual pressure test (segregated pressure for each coal zone validated by the ERCB for the control well)	Sections 11.145(1)(a) and (4)(a) of *OGCR*; Sections 4.91 and 7.1 of *Directive 040*	• Annual segregated tests are to be conducted and submitted to the ERCB electronically using the ERCB Well Test Capture system. • Annual tests may be conducted at any time during the calendar year. However, annual tests not received by the ERCB by March 31 of the following year will place the licensee in noncompliance.
Initial production test	Sections 11.145(1)(b), (4)(b), and (6) of *OGCR*; Section 7.1 of *Directive 040*	• Initial flow meter logs are to be conducted over each coal zone validated in the control well or, alternatively, initial segregated flow tests may be conducted on each coal zone validated in the control well. • Test results are to be submitted in paper format to the attention of Section Leader, Coal and Unconventional Gas, Geology and Reserves, ERCB, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4, within 4 months of the validation of the control well by the ERCB.
Annual production test	Sections 11.145(1)(b) and (4)(b) of *OGCR*; Sections 4.9.1 and 7.1 of *Directive 040*	• Annual flow meter logs are to be conducted over all coal zones validated in the control well or, alternatively, segregated flow tests may be conducted on each coal zone validated in the control well. • Test results are to be submitted in paper format to the attention of Section Leader, Coal and Unconventional Gas, Geology and Reserves, ERCB, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4. • Annual tests may be conducted at any time during the calendar year. However, annual tests not received by the ERCB by March 31 of the following year will place the licensee in noncompliance.
Initial fluid analysis (may be either on single coal zone or for combined coal zones)	Section 11.070 of *OGCR*; Sections 3.5, 4.8, 4.9, and 7.1 of *Directive 040*	• Initial analyses of each produced fluid must be conducted for the combined production stream. • If in a DE, test must be conducted within 30 days of the well commencing commingled production. • Test results are to be submitted electronically to the ERCB within 45 days of completion of the test using the ERCB Well Test Capture system.

4.2 Requesting Validation of a Control Well

An application must be filed with the ERCB for a well to be designated as a control well. This request must be made using the CBM Desorption Control Well form or the CBM Pressure and Flow Control Well form included in Appendices A and B. Each control well form must also be accompanied by a completed Resources Applications Schedule 1 (see Appendix C). These forms are also available on the ERCB Web site www.ERCB.ca under Industry Zone : Rules, Regulations, Requirements : Directives. The ERCB will not evaluate requests for control well designation without receiving these forms.

With the filing of the control well form, the licensee acknowledges that upon submission of the control well request to the ERCB, all information relating to the proposed control well will no longer be held confidential by the ERCB. The exception to this is the desorption report, which will still retain its confidentiality, in accordance with Section 12.150 (5)(a) of the *OGCR*. Any cuttings and/or sidewall core calibration (described in Section 5.1.2 of this directive) submitted in conjunction with a desorption control well request will become part of the public record.

If the ERCB has questions regarding a control well application, you will have five working days to supply any required additional information. If the required information is not provided to the ERCB within that timeframe, the control well application may be closed.

4.3 Desorption Control Wells

Desorption tests are conducted on control wells to establish the in situ gas content and reservoir characteristics from the desorption profile of the coal. A desorption control well requires a full suite of geophysical logs for the well and at least one core sample for each coal zone being developed in the area. Cuttings may be used in place of core for desorption testing, provided that the test results can be calibrated to a core desorption test for the coal zone in a well within the same township or an offsetting township.

Core or cuttings may be collected on wells with any target completion, and desorption control wells do not have to produce from the coals.

The applicant for a desorption control well does not need to be the well licensee of the proposed control well, but must provide all required information.

4.3.1 CBM Desorption Control Well Validation Types and Process

Desorption control well applications are validated in two ways—preliminary validation or full validation—and this is determined by whether the complete desorption report is available. The ERCB Web site list for desorption control wells differentiates between preliminary and full validation.

Applications for either preliminary or full validation must be filed using the CBM Desorption Control Well form (Appendix A). The appropriate box on the form must be checked to indicate whether a preliminary or full validation is being requested.

To initiate the application process, submit the completed and signed form with digital copies of the geophysical logs in LAS 2 format to the ERCB Control Well Coordinator, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

Preliminary Validation

- Preliminary validation of a desorption control well allows for CBM production within a 5 kilometre (km) radius of the well (assuming the required pressure and flow control well coverage is in place) in the intervening time between preliminary and full validation.

- Preliminary validation of the desorption control well using full-diameter core may be applied for when the complete desorption report is not yet available. Preliminary validation will not be considered if the complete desorption report is available.

- Preliminary validation of a desorption control well using non-full diameter core may be applied for when the complete desorption report is not available for either the non-full diameter core or the full-diameter core to which the well will be calibrated. The ERCB expects that a complete desorption report for a full-diameter core in an adjacent township will be used for calibration in preference to a full-diameter core for which the desorption test is not yet completed.

- To initiate a preliminary validation, submit the CBM Desorption Control Well form, digital copies of the geophysical logs in LAS 2 format, and a preliminary report. The preliminary report must include the canister numbers, sample type (core, cuttings, or sidewall core), top and bottom depth of each sample, and date the sample was collected. In addition, if non-full diameter core is being used for the desorption test, you must provide confirmation that you have access to the offsetting full-diameter core report to be used for calibration.

- With receipt of the completed control well form and supporting information, the ERCB will evaluate the coal zones and sampled intervals and

  - advise the applicant which coal zones (all, some, or none) are validated through a disposition letter, and

  - include the well with validated coal zones on the Web site list of CBM Desorption Control Wells.

  Issuance of the letter approving the control well and listing the well on the Web site may not be simultaneous.

- If a preliminary validation has been made or requested, a subsequent new application for a control well filed must be filed to obtain a full validation when the full desorption report is available (see Table 2). Full validation is conditional on receipt and approval of the complete desorption report and, where applicable, the calibration report. If the report(s) is not received in the timeframes set out in Table 2 or the test fails the criteria detailed in Section 4.3.2, the preliminary validation of the control well or specific zones may be rescinded.

Full Validation

- Full validation of a desorption control well must be applied for when the complete desorption report is available (see Table 2). A complete desorption report consists of, but is not limited to, the unedited text of the report, all tables, figures, sampling program, gas-in-place calculations, and all appendices, including the raw data sheets.
- With receipt of the completed control well form and supporting information, the ERCB will evaluate the coal zones and sampled intervals and

- advise the applicant which coal zones (all, some, or none) are validated through a disposition letter, and
- include the well with validated coal zones on the Web site list of CBM Desorption Control Wells.

Issuance of the letter approving the control well and listing of the well on the Web site may not be simultaneous.

- Upon full validation of all zones applied for, no further desorption submissions or testing is required.

Table 2 summarizes the scheduling and submission path for desorption reports for both preliminary and full validation of a desorption control well.

Table 2. Desorption Control Well Validation Types and Submission Requirements

Validation type	When to apply	Timing of submission of full desorption report[1]	Timing of submission of cuttings to core calibration report[2]	Timing of submission of preliminary desorption report[2]
Full validation of full-diameter core	Complete desorption report is complete	Prior to or at time of application	Not applicable	Not applicable
Full validation of non-full diameter core (cuttings or sidewall core)	Complete desorption and calibration reports are complete	Prior to or at time of application	At the time of application	Not applicable
Preliminary validation of full-diameter core	Complete desorption report is not complete	Within 6 months of completion of desorption analysis or within 12 months of the control well validation, whichever is sooner	Not applicable	At the time of application
Preliminary validation of non-full diameter core (cuttings or sidewall core)	Complete desorption and calibration reports are not complete	Within 6 months of completion of desorption analysis or within 12 months of the control well validation, whichever is sooner	At the time of application	At the time of application

[1] Send two paper copies and a CD ROM of the complete desorption report to the Section Leader, Coal and Unconventional Gas, Geology and Reserves, ERCB, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

[2] Send one paper copy of any calibration report or preliminary desorption report with the completed control well application form to the ERCB Control Well Coordinator, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

4.3.2 Desorption Test Requirements

The ERCB considers CBM production to be gas produced from completions in coals, with coal defined as a lithostratigraphic unit having 50 per cent or greater by weight organic matter and being thicker than 0.30 metres (m). Gas produced from coals thinner than 0.30 m do not require CBM desorption control well coverage. However, a desorption test on a full-diameter core sample from a coal zone of less than 0.30 m may be used for coal zone coverage for desorption control well purposes in areas where these are the only types of samples available. Tests on carbonaceous intervals with no coal present cannot be used to validate CBM zones.

Desorption reports are accepted for control well validation from full-diameter core samples or from drill cuttings/sidewall core that have been calibrated against full-diameter core measurements taken in the same or an adjacent township. Desorption reports from full-diameter core samples will not be accepted for control well validation if non-coal lithologies were sampled, severe lost gas time occurred, excessive head space was present, manometer contamination or leaks occurred, or large differences existed between measured gas and total gas. Samples should be desorbed at reservoir temperature until most of the gas is measured, and then heating or crushing can be done for the total gas volume. The results of the desorption tests must be submitted to the ERCB within 6 months of the completion of the desorption analysis or 12 months following the designation of the control well, whichever occurs first, as noted in Table 2.

4.3.3 Cuttings and Sidewall Core Calibration

Desorption measurements from cuttings and sidewall cores require calibration against full-diameter core measurements taken from the same or offsetting township to qualify for control well validation. The details of the desorption analysis and cuttings calibration that the ERCB would expect to be submitted to validate a cuttings or sidewall core desorption control well are as follows:

1) *Process of sample collection:* A detailed description of the processes used by the lab to ensure that sample collection volume, chip size/sidewall core size, cleaning and sieving, canister seal timing, and sample quality determination were appropriate.

2) *Description of chip size/sidewall core size:* A detailed summary of the chip/sidewall core size, in millimetres (mm), for each sample determined after the desorption process, preferably as a histogram of percentage of each chip size category.

3) *Rapid desorption treatment:* A description of the rapid desorption process for the sample (e.g., heating vs. crushing vs. solution), and what impact it had on the gas content results.

4) *Explanation of moisture basis in reporting:* A comparison of the dry ash-free results to the raw uncorrected air-dried gas content (usually referred to as total gas content) results and an explanation of significant discrepancies.

5) *Point-to-point plot of gas content trend:* A comparison of the cuttings or sidewall core raw uncorrected air-dried gas content to the adjacent full-diameter core as-received gas content to display any trends of the uncorrected gas contents. This would include

   - a plot of the cuttings or sidewall core raw uncorrected air-dried gas content (usually reported as total gas content) and adjacent full-diameter core as-received gas content (usually reported as total gas content) vs. depth, and
   - a plot of the cuttings or sidewall core raw uncorrected air-dried gas content and the full-diameter core as-received gas content vs. ash content.

   These plots must be graphically (as a point-to-point trend) represented. Linear regression is not to be used, sample data cannot be averaged, and other corrected values, such as dry ash free or cavings corrected values, are not to be used for this plot.

There are a number of sample collection and desorption methods available. It is not the ERCB's intent to be prescriptive on what methods are appropriate in all cases. However, the limitations of the reliability of the gas content data need to be established to ensure that the data are representative. The ERCB does this by determining variations from a best-case

sampling and testing situation set out in Appendix D. This best case is not a minimum requirement for a desorption test but is an optimum testing scenario.

For cuttings calibrations, all coal seams in the coal zone that can be sampled should be sampled to enable the cuttings calibration to be validated. Where there are more than two coal seams in a zone but only two coal seams are sampled, the results are uncertain. If drilling operations preclude the recovery of cuttings from more than two coal seams, a detailed explanation of those conditions must be included with the calibration description, and the ERCB will make the final decision on the validation. If multiple coal seams are present in the coal zone and only one coal seam in the coal zone is sampled, the cuttings calibration will not be validated, as a gas content trend cannot be established.

Licensees intending to calibrate cuttings to full-diameter core should confirm the suitability of the core for cuttings calibrations. Core may be validated as a control well with only one coal seam sampled per zone. However, validation of a cuttings well as a control well may require calibration to a well with multiple core for multiple seams. In order to show a match in trend in the point-to-point trend between the cuttings and core, more than one point per zone may be required in both wells, if it is not a single-seam zone. A trend is needed to show whether the variation in the multiple cuttings results is due to sampling and lab protocols or geology.

Additional information to augment available desorption tests and support the desorption control well request, such as yield plots, regional gas content maps, pressure/gas content relationships, and other technical studies, may be submitted to the ERCB to assist in the validation of a desorption control well.

4.4 CBM Pressure and Flow Control Wells

Pressure and productivity data from coals are required to determine CBM reserves and reservoir characteristics, including extent and continuity of the various coal zones.

Pressure and flow control wells must remain on production in order for them to remain as validated control wells.

For CBM wells producing from multiple coal zones, both the pressure data and the flow data must be collected from the same pressure and flow control well.

Single-zone CBM developments require pressure and flow control wells. However, flow data requirements in this case may be met through the reported production from any well producing from only the coal and no other lithologies. Only the single coal zone needs to be pressure tested to meet initial and annual testing obligations.

As a minimum, segregated pressure tests must be conducted initially and annually thereafter on the coal zones validated for the control well by the ERCB in order to maintain control well status. Further segregation at closer intervals during testing is at the discretion of the licensee.

Flow meter logs should be collected after the well has been completed and cleaned up.

4.4.1 CBM Pressure and Flow Control Well Form and Validation

The CBM Pressure and Flow Control Well form is in Appendix B.

Before a CBM Pressure and Flow Control Well application is submitted,

- the proposed control well must be drilled,

- the proposed control well must be completed in coals only,
- copies of geophysical logs in LAS 2 format must be available, and
- the completion records must be submitted electronically to the ERCB through the Well Records System (WRS).

The applicant must submit the completed and signed form with the digital copies of the geophysical logs in LAS 2 format directly to the ERCB Control Well Coordinator, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

Upon receipt of this form and supporting information, the ERCB will evaluate the well's completed coal zones, advise the licensee whether the well and specific coal zones meet the control well criteria, and include the well with validated coal zones on the list of CBM Pressure and Flow Control Wells as appropriate.

Licensees may request validation of a control well for pressure and flow before or after the well is tested.

- If the licensee requests validation of a CBM pressure and flow control well before testing the well, the testing and submission of data must be completed within 4 months of the date of the ERCB validation of the control well.

- If the licensee requests validation of a CBM pressure and flow control well after testing the well, the existing pressure and flow tests on the well will be used in the control well evaluation, provided that the existing tests were conducted not more than 12 months before the date of the control well validation request.

In either of the above cases, each coal zone validated by the ERCB in the control well must be tested. Any zone not tested in accordance with the ERCB-validated zones must be retested to continue the control well status for the zone. The required testing must be conducted and submitted within 4 months of the date of the ERCB's original validation of the control well and coal zones.

Failure to comply with the annual pressure and flow data requirements will place the licensee in noncompliance (see Section 8).

4.4.2 Identification of Coals Through Geophysical Logs

A well must be completed in coals only in order to be validated as a pressure and flow control well. Geophysical well logs are the most common form of data available for determining lithology in a well. The open hole geophysical logs (gamma ray, caliper, neutron, density, and resistivity) are preferred for determining lithology in control wells. Coals can be recognized by characteristically high neutron/density porosity, low gamma ray, and high resistivity responses.

Coals are subject to caving while drilling, which can be identified from the caliper log. If the caving prevents a clear identification of the lithology from logs, the licensee will need to provide additional information (e.g., additional logs, correlations from offset wells, core, sample descriptions) to support its case that the completed zone occurs within a coal lithology.

Where cased hole logs are used, the licensee may be required to provide additional evidence to support its lithologic interpretations if it is not clear that the perforated intervals are within coals.

4.4.3 Non-Coal Lithologies in Pressure and Flow Control Wells

Pressure and flow information from control wells must be from the coal zones only to be of maximum value in assessing Alberta's CBM resources. Accordingly, pressure and flow control wells must be completed in coals only. The ERCB considers CBM production to be gas produced from completions in coals, with coal defined as a lithostratigraphic unit having 50 per cent or greater by weight organic matter and being thicker than 0.30 m. The identification of coals can be problematic in wells with limited log data, and perforated intervals are not always limited to strata clearly recognized as coals. The successful completion of a pressure and flow control well requires an understanding of the distinction between the definition of a coal zone that may include all lithologies and the more restrictive coal-only completion required for control wells.

The ERCB recognizes that it is difficult to precisely identify and complete a coal-only interval that excludes carbonaceous shales. Therefore, completions within both carbonaceous shales and coals will be considered acceptable for a pressure and flow control well. However, perforated intervals should not extend into non-carbonaceous material. A small amount of completion in strata of indeterminate lithology or non-carbonaceous shales adjacent to coals will be accepted in a pressure and flow control well, but only to the extent that the ERCB is satisfied that the data are representative of the pressure and productivity of the coals only.

Completions in sandstones and other productive lithologies other than carbonaceous shales are not accepted in a control well. Therefore, where completions in these productive lithologies exist in a well proposed to be a control well, complete and permanent segregation from the coal zones must be shown in order for the well to be considered for validation as a pressure and flow control well.

5 Deferral and Exceptions to Control Well Requirements

As described in Section 7.025(1) of the *OGCR*, all CBM production must meet control well requirements. However, the ERCB is willing to consider exceptions to control well requirements for the specific cases discussed in the sections below. These exceptions may require the collection of some segregated coal zone data and are considered on a well-specific basis only.

5.1 Control Wells in Exploration Areas

A company planning an exploratory program to target gas production from coals may request a deferral of control well requirements for the initial well(s) in the exploratory area. However, any deferral of control well requirements must be requested and granted by the ERCB **before** the onset of production, and preferably before drilling.

The ERCB will consider requests for the deferral of control well requirements for a limited number of wells targeting coals in areas where there are no completions in the targeted coal zone(s) within 5 km of the exploration well.

"Exploration well," for the purposes of this directive, means a CBM well in an area currently undeveloped for the targeted coal zone and is in no way related to the Lahee classification of "exploratory well."

The applicant must provide a detailed plan to the ERCB for approval of deferral of control well requirements that includes

- the type of deferral (desorption, pressure and flow, or both);
- the location of all wells for which deferral is requested, along with the well licence number (if available), the proposed total depth, and the anticipated coal zone(s) for each well;
- a schedule of when the wells will be drilled;
- the existing CBM well spacing in area of interest;
- map(s) showing the proposed exploration well(s) and the closest producing CBM well(s); and
- a list of the data that will be collected from these wells during the exploration phase, along with a timetable for the collection of the data. The ERCB expects that the minimum standard initial gas well testing requirements, as set out in *Directive 040*, will be met for all wells included in the deferral request. These minimum requirements include a segregated fluid analysis, initial pressure, and initial deliverability test for each coal zone being produced. These data must be submitted to the ERCB in accordance with *Directive 040*.

The applicant must commit to having validated desorption and pressure and flow control wells in place for all proposed CBM production wells by the end of the deferral period. The maximum time allowed for the deferment of control well requirements will depend on the scope of the project but will not exceed 18 months.

The ERCB will not consider any such requests for the exploration for CBM in the area and strata of Development Entity No. 1.

Applications for the deferral of control well requirements for exploration areas must be submitted to the ERCB Control Well Coordinator, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

5.2 Control Wells in Legacy Areas

Control wells are required for all areas of CBM development. This includes CBM developments that previously required ERCB approval of commingled production through a MISC or MU Order. The vast majority of these orders indicated that the commingled CBM development was subject to pressure and flow control wells being established, generally one control well per four-section area. Accordingly, the ERCB expects that appropriate CBM pressure and flow control well coverage is in place for these areas, but recognizes that there may be an insufficient coverage for desorption control wells.

For CBM development not requiring commingling approval, standard gas well testing requirements applied prior to October 31, 2006. Therefore, the subsequent establishment of CBM pressure and flow control wells should present fewer issues than do desorption control wells for these areas.

Exceptions to control well requirements may be requested in legacy areas where CBM has been developed to the maximum well density allowed by existing spacing rules and no further drilling for CBM is expected. If further drilling for CBM subsequently occurs in a legacy area where relief from desorption control well requirements was granted, control wells will be required for the new drilling.

An application for exceptions to control well requirements, whether for full relief or for reduced control well requirements, must include

- the reason an exception is being requested, along with supporting discussion;
- type of exception (desorption, pressure and flow, or both);
- a list of the CBM wells requested for exception from control well requirements, including
  - the finished drilling date for each well, and
  - the coal zones (with top and base) in each well(s);
- a statement of the current well spacing for the CBM development;
- a map or maps of the area of interest legibly showing
  - the company land ownership,
  - CBM production wells, and
  - the nearest pressure and flow and desorption control well(s);
- a list of any wells licensed but not drilled in the area, including the well licensee and the target zone; and
- the MU or MISC Order number granted for commingled CBM production, if applicable.

Applications for exceptions to control well requirements must be submitted to the ERCB Control Well Coordinator, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

5.3 Other Exceptions from Control Well Requirements

In some other circumstances, the ERCB will consider applications for exceptions to control well requirements on a well basis only, whether for full relief or reduced control well requirements. Such circumstances include the following:

- A well is designated by the ERCB as a farm gas well with CBM production.
- A well was in compliance with control well requirements under a commingling order (MISC/MU Order), but the new control well requirements in the *OGCR* placed the well in noncompliance.
- A well is in an area that has discontinuous coal zones where the extent of the coal cannot be reasonably predicted or mapped.

  A request for an exception to control well requirements made on the basis of a geological argument must include
  - a minimum of two cross-sections that intersect;
  - for the desorption control well exceptions, a discussion of the applicant's attempts to collect representative core or cuttings for the relevant coal zones;
  - confirmation that there is existing control well coverage for the completed continuous coal zones; and
  - supporting maps and analyses describing the current understanding of CBM gas content in the area of the exception request.
- An area has isolated CBM wells, a well has unproductive CBM completions, and/or no further CBM development is expected to occur.

  A complete submission requesting the exception must include
  - the reason an exception is being requested, along with supporting discussion;
  - the type of exception (desorption, pressure and flow, or both) requested;
  - the unique well identifier (UWI) for each CBM well for which relief from control well requirements is requested, and the following information for each well:

    - finished drilling date,
    - total depth,
    - all completions, including non-coal,
    - wellbore schematic,
    - drilling method (e.g., air, mud-based system),
    - details of any stimulation of coals,
    - identification of the coal zones and top/bottom depths, and
    - productivity of the well, including any water production and its source;
  - a map or maps of the area of interest legibly showing
    - the company land ownership, and
    - CBM well spacing;
  - initial pressures of all completed zones; and
  - confirmation that a commingling application has been submitted if there are multiple coal zones and/or non-coal lithologies being produced in a commingled manner in the well(s) if required by the criteria in *Directive 065: Resources Applications for Conventional Oil and Gas Reservoirs*, Section 3.1.

If further drilling for CBM production subsequently occurs in an area where exceptions to control well requirements were granted, control wells will be required for the new wells drilled.

Applications for an exceptions to control well requirements must be submitted to the ERCB Control Well Coordinator, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

5.4 Replacing Validated Pressure and Flow Control Wells

The ERCB recognizes that there may be situations when it is necessary to replace a validated pressure and flow control well with a new control well, such as the following:

- There is a mechanical failure of the original control well or there is watering out of the well.
- The proposed replacement well has better vertical coverage; that is, more zones can be validated in a single location.
- A high density of validated control wells renders a validated control well unnecessary.

Companies are expected to use forethought in selecting control well candidates to optimize coverage for their CBM developments. The ERCB will not consider substituting control wells based solely on improved areal coverage, except in developing areas. An application to substitute a validated pressure and flow control well with a new control well requires the following information:

- the reason replacement is being requested, along with supporting discussion;
- if the proposed replacement well has not been validated, a completed pressure and flow control well form, in accordance with Section 4.3, for the proposed replacement control well;
- if the proposed replacement well has been previously validated, the UWI of the proposed replacement control well;

- a comparative table of coal zones and completion intervals (in metres at kelly bushing [mKB]) showing the previously validated control well and proposed replacement control well;
- confirmation that notice has been sent to all well licensees that have wells within the radius of the currently validated control well to be replaced, and a summary of the results of the notification: the notice must be sent to licensees of any drilled or licensed well, with the exception of abandoned wells, regardless of completion zone or targeted zone, and the notification letter must provide a minimum of 15 working days from the date of the letter for response;
- a table listing the well licensees notified and the UWIs of the wells held by each licensee; and
- a plat illustrating the validated and proposed control wells and their respective validation radiuses.

An application request for the replacement of a control well must be submitted to the ERCB Control Well Coordinator, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

6 Identification and Reporting of Production from Pressure and Flow Control Wells

6.1 Well Fluid Status

All validated producing CBM pressure and flow control wells must report production to the Petroleum Registry of Alberta using the CBMCLS (23) fluid status code.

For CBM wells completed in both coals and other productive lithologies (e.g., sandstone), the fluid status code CBMOT (22) must be used. This code must never be used for CBM pressure and flow control well production, as these control wells must be completed in coals only.

6.2 Production Pool Codes

Wells with a single coal zone completion must use the appropriate CBM pool code.

CBM pressure and flow control wells producing commingled in a development entity (DE) must use the DE pool code to report production (DE 1 – 990160 or DE 2 – 990260).

The designation of a well as a control well does not approve commingled production from the well. Therefore, if the well is producing commingled outside of a DE, ERCB approval to commingle is required in order to produce CBM, and the applicable field code and the "999660" pool code must be used to report production.

The following pool code options must **not** be used to report CBM production:

- Edmonton or Belly River Group pool codes, including Undefined;
- self–declared production pool code; and
- discontinued commingling notification pool code (rescinded effective December 15, 2006).

7 ERCB Supporting Systems

7.1 Control Wells on the ERCB Board Order System

Effective October 1, 2007, the Board Order System (BOS) provides a searchable data layer for all pressure and flow and desorption control wells. Each control well is indicated by a circle of the appropriate radius around the well indicating the area of coverage for the well. The control well data layer can be searched by CBM zone, control well ID, licensee, and well type (desorption vs. pressure and flow). BOS provides a visual tool to enhance the official data on the ERCB Web site.

7.2 Proposed Future Enhancements

All control well forms and supporting documents will still need to be submitted on paper. At this time, control well requests cannot be submitted to the ERCB through the Electronic Application System (EAS), although applicants will receive an electronic disposition of the application. The ERCB is working on an enhancement to EAS to allow electronic submission of the control well forms and attachments.

8 Compliance Assurance for Control Wells

The ERCB requires licensees to meet all initial and ongoing requirements for control wells for CBM developments. Licensees are encouraged to review their developments on an ongoing basis to ensure that they are in full compliance with control well requirements. Such compliance includes the required control well coverage in terms of area and with respect to all coal zones being developed, together with the associated tests.

If a licensee determines that it is not fully compliant with all CBM control well requirements, a voluntary self-disclosure (VSD) of the noncompliance may be filed, in accordance with Section 6 of *Directive 019: ERCB Compliance Assurance—Enforcement*. A valid VSD will require the noncompliant wells to be shut in until compliance is restored. The VSD must be submitted directly to the ERCB Enforcement and Surveillance Section, Resources Applications, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4, and include

- a list of wells completed in coals currently noncompliant with control well requirements;
- a detailed action plan and short-term schedule to become fully compliant with all ERCB control well requirements for CBM (e.g., specified well recompletions, locations, and dates new wells are to be drilled), using the Excel spreadsheet on the ERCB Web site www.ercb.ca under Industry Zone : Rules, Regulations, Requirements : Control Well Requirements associated with *Directive 019*;
- map(s) showing the noncompliant wells and proposed control well locations, with appropriate radial coverage demarcated; and
- a written commitment from the licensee, including the date by which it will become fully compliant respecting pressure and flow control well requirements and the date by which it will become fully compliant respecting desorption control well requirements, as well as a written commitment to remain in compliance thereafter with all ERCB control well requirements.

The ERCB will review the self-disclosure and action plan and, if necessary, work with the licensee to ensure that the plan will result in the licensee becoming fully compliant with control well requirements. Once the ERCB determines that the self-disclosure and related action plan are acceptable, it will issue an acceptance of the self-disclosure and plan. A well

licensee must not assume that the ERCB has found its self-disclosure and action plan to be acceptable until it receives confirmation from the ERCB.

The licensee must file a report by the dates specified in the action plan confirming that it has carried out the plan and is fully compliant in terms of the areas requiring control wells, the coal zones covered, and testing.

A failure to meet the commitments of an action plan and/or to report to the ERCB that full compliance has been achieved by the dates specified will result in enforcement under *Directive 019*.

A VSD may not be filed after the ERCB has through its own surveillance determined that the well licensee is not fully compliant with control well requirements. In such cases, the ERCB will proceed with enforcement actions in accordance with *Directive 019*.

Any chronic trend of noncompliance by a licensee may result in the ERCB rejecting continued VSDs on the basis of unfair competitive advantage relative to compliant licensees.

Appendix A CBM Desorption Control Well Form

ERCB Energy Resources Conservation Board

Coalbed Methane Desorption Control Well

ERCB USE ONLY

Application No. _____ Date: Month _____ Day: _____ Year: _____

Attach a completed copy of Resources Applications Schedule 1 to the front of your application.

Prior to the submission of this form, well licensees must have drilled the well, collected samples, and have available digital copies in LAS 2 format of the geophysical logs used to determine the top and base of coal zones in the well listed in Section 1. This form and its required attachments must be sent to the **Control Well Coordinator** at the address below.

1. BASIC INFORMATION REQUIREMENTS

Unique Well Identifier __ __ / __ __ - __ __ - __ __ __ - __ __ **W** __ / __

Sample Interval	Core / Cuttings	Interpreted Coal Zone Name	If samples are from cuttings, they must be calibrated to core tests within one offset township. Provide the **UWI** that the samples are calibrated to, if applicable:
Top _____ mKB Base _____ mKB	☐ ☐	_____	UWI _____
Top _____ mKB Base _____ mKB	☐ ☐	_____	UWI _____
Top _____ mKB Base _____ mKB	☐ ☐	_____	UWI _____
Top _____ mKB Base _____ mKB	☐ ☐	_____	UWI _____
Top _____ mKB Base _____ mKB	☐ ☐	_____	UWI _____
Top _____ mKB Base _____ mKB	☐ ☐	_____	UWI _____
Top _____ mKB Base _____ mKB	☐ ☐	_____	UWI _____

The following analyses will be performed and two paper copies and one CD ROM of the report submitted to ERCB Section Leader, Coal and Unconventional Gas, Geology and Reserves, ERCB, 640 – 5 Avenue SW, Calgary, Alberta T2P 3G4.

☐ Adsorption Analysis (AA) ☐ Desorption Analysis (DA) ☐ Desorption Gas Analysis (DGA)

☐ Proximate Analysis (PA) ☐ Ultimate Analysis (UA) ☐ Vitrinite Analysis (VR)

2. COMPLETENESS CHECK

☐ Digital geophysical logs in LAS 2 format are attached to this form.

☐ All basic well data have been submitted to the ERCB through WRS.

☐ Request for preliminary validation or ☐ Full validation with report and calibration if needed.

☐ The applicant has access to the complete desorption report for the full-diameter core to be used to calibrate the cuttings.

☐ The preliminary report is attached if preliminary validation is requested.

☐ The calibration report is attached for full validation of cuttings or sidewall core.

Submission of this form to the ERCB confirms commitment by the well licensee, as noted above, to submit desorption analysis on the coal zones identified to the ERCB, in accordance with the *Oil and Gas Conservation Regulations*, Sections 7.025 and 11.145. Submission of this form acknowledges that all data filed with this form become publicly available at the time of the submission to the ERCB and thereafter.

Signature: _____ Date: _____

Appendix B CBM Pressure and Flow Control Well Form

ERCB Energy Resources Conservation Board

Coalbed Methane Pressure and Flow Control Well

ERCB USE ONLY

Application No.: _____ Date: Month _____ Day _____ Year _____

Attach a completed copy of Resources Applications Schedule 1 to the front of your application.

Prior to the submission of this form, well licensees must have completed the well, submitted completion records to the ERCB through the Well Records System (WRS), and have available digital copies in LAS 2 format of the geophysical logs used to determine the top and base of coal zones in the well listed in Section 1. This form and its required attachments must be sent to the **Control Well Coordinator** at the address below.

1. BASIC INFORMATION REQUIREMENTS

Unique Well Identifier

__ __/__ __-__ __-__ __ __ __-__ __W__/__

Pressure Test Intervals	Proposed / Actual	Interpreted Coal Zone Name
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____
Top _____ mKB Base _____ mKB	☐ ☐	_____

Flow Test ☐ Has been conducted OR ☐ Will be conducted

2. COMPLETENESS CHECK

☐ Digital geophysical logs in LAS 2 format are attached to this form.

☐ Completion records have been submitted to the ERCB through WRS.

Submission of this form to the ERCB confirms commitment by the well licensee, as noted above, to the initial and annual data requirements for CBM Pressure and Flow Control Wells, in accordance with the *Oil and Gas Conservation Regulations*, Sections 7.025 and 11.145. Submission of this form acknowledges that all data filed with this form become publicly available at the time of the submission to the ERCB and thereafter.

Signature _____ Date _____

Energy Resources Conservation Board, 640 - 5 Avenue, Calgary, Alberta T2P 3G4

Appendix C Resources Applications Schedule 1

ERCB Energy Resources Conservation Board

Resources Applications Schedule 1

1. REGISTRATION

Month ___ Day ___ Year ____ Applicant's File Number _____

ERCB USE ONLY

Registration Number: _____ Registration Date: Month ___ Day ___ Year __

Company Name _____ Company Code _____

Contact Person (N/A ☐) _____ _____
Last Name First Name

Telephone _____ Fax _____

E-mail Address _____

Consultant (N/A ☐) _____ _____
Company Name Consultant Code

Consultant Contact Person _____ _____
Last Name First Name

Telephone _____ Fax _____

E-mail Address _____

2. BASIC INFORMATION REQUIREMENTS

1. Field, Strike Area, and Pool

Field Code No./Name	Strike Area Name	Pool Code No./Name

2. What is the ownership basis on which you make this application?

3. Have you completed the notification requirements? Yes ☐ No ☐

4a. Do you need ERCB assistance to complete the notification requirements? Yes ☐ No ☐ If Yes, please supply details.

4b. Are there outstanding concerns? Yes ☐ No ☐

5. Does your injectant contain hydrogen sulphide (H_2S)? Yes ☐ No ☐

5a. If Yes, is a new emergency response plan (ERP) needed, or does an existing ERP need updating? Yes ☐ No ☐

5b. If No, state why not _____

5c. If Yes, supply details _____

(continued on next page)

Company Name _____

5d. Have you conducted notification for ERP purposes to all potentially affected parties? Yes ☐ No ☐

5e. If Yes, are there any outstanding concerns?

_____

_____

6. Are you applying to amend an existing approval or order? Yes ☐ No ☐

_____

_____

6a. If Yes, what is the existing approval or order number? _____

6b. Is the name of the approval holder current? Yes ☐ No ☐

3. TYPES OF APPLICATIONS

1. What types of resources applications are you submitting at this time?

DIRECTIVE 065

Unit 1 - Equity

- ☐ Rateable Take (1.1)
- ☐ Common Purchaser (1.2)
- ☐ Common Carrier (1.3)
- ☐ Common Processor (1.4)
- ☐ Compulsory Pooling (1.5)
- ☐ Special Spacing (1.6)

Unit 2 - Conservation

- ☐ Enhanced Recovery Scheme (2.1)
- ☐ Concurrent Production (2.4)
- ☐ Pool Delineation and Ultimate Reserves (2.5)

Unit 3 - Production Control

- ☐ Commingled Production (3.1)
- ☐ Good Production Practice (Primary Depletion Pool) (3.2.2)
- ☐ Gas-Oil Ratio Penalty Relief (3.2.3)
- ☐ Special Maximum Rate Limitation (3.2.4)
- ☐ Gas Allowable (3.3)

Unit 4 - Disposal/Storage

- ☐ Disposal (Class I-IV) (4.1)
- ☐ Acid Gas Disposal (4.2)
- ☐ Underground Gas Storage (4.3)

Unit 5 - Corporate Changes

- ☐ Change in Name of Approval Holder (5.1)
- ☐ Change of Holder of Approval (5.2)

Unit 6 – Gas and Ethane Removal

- ☐ Short-Term Gas Removal (6.3.1)
- ☐ Long-Term Gas Removal (6.3.2)
- ☐ Short-Term Ethane Removal (6.3.3)

DIRECTIVE 062

- ☐ Coalbed Methane Pressure and Flow Control Well
- ☐ Coalbed Methane Desorption Control Well
- ☐ Deferral of Coalbed Methane Control Well Requirements
- ☐ Exception to Coalbed Methane Control Well Requirements

4. FUTURE APPLICATIONS

1. Do you plan to submit subsequent applications associated with the present applications to the ERCB within six months?
   Yes ☐ No ☐
2. If Yes, state what types and when you plan to submit these applications.

_____

_____

_____

Note: Remember to file three copies of the application package, including Schedule 1, unless otherwise specified in individual units of this directive.

SUBMIT APPLICATIONS TO

Energy Resources and Conservation Board
Resources Applications Group
640 - 5 Avenue SW
Calgary, Alberta T2P 3G4

Appendix D Best-Case Scenario for Sample Collection and Desorption Testing Methods for Cuttings and Sidewall Core

Example of the best case for cuttings

- Prior to desorption testing:
  - the sample is coal only,
  - the sample is washed and sieved,
  - there is no drilling mud in the sample,
  - more than 60 per cent of the cuttings are greater than 2 millimetres (mm) in size, and
  - there is minimal lost gas time prior to placing the sample in a canister.
- During desorption testing:
  - minimal head space existed,
  - no manometer contamination or leaks occurred, and
  - the rapid/quick/residual gas desorption process is conducted only after the cumulative desorption volume is less than 5 cubic centimetres (cm^3) over 150 hours.
- After desorption testing:
  - the float fraction is greater than 25 per cent when subjected to float sink analyses.

Example of best case for sidewall core

- Prior to desorption testing:
  - each sample is retrieved by a single trip,
  - the core is 2.54 cm in diameter by 10 cm in length or larger,
  - the canisters are sized to match the core size,
  - the core retrieval is done by percussive methods, and
  - there is no drilling mud in the sample.
- During desorption testing:
  - the rapid/quick/residual gas desorption process is conducted only after the cumulative desorption volume is less than 5 cm^3 over 150 hours.
- After desorption testing:
  - examination of the core shows less than 20 per cent deterioration to fines.